

ARGONNE NATIONAL LABORATORY

HIGH ENERGY PHYSICS DIVISION

AWA

ARGONNE WAKEFIELD ACCELERATOR

AWA LINAC TUNNEL SAFETY SYSTEMS

Approved:

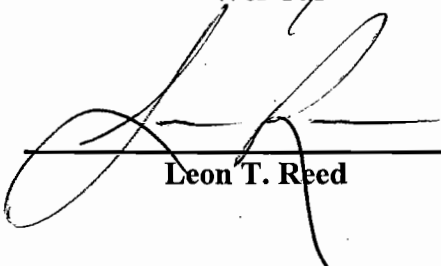
HEP-AWA Group Rep:



Wei Gai

Date: 3/19/07

HEP-ESH Administrator:



Leon T. Reed

Date: 3/19/07

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Prepared:  Date 25 FEB 99
Paul Schoessow, HEP-AWA Group Rep

Approved:  Date 2-25-99
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AWA LINAC TUNNEL SAFETY SYSTEMS

I. INTRODUCTION

The 20 MeV AWA Electron Linac in Building 366 is a pulsed-electron accelerator, which will provide a 20 MeV, beam with a pulse width of a few picoseconds.

Since the accelerator can accelerate high current pulses at high energy, it is capable of producing intense radiation fields. In addition, a laser hazard exists due to the laser beam directed onto the photo cathode electron source. To protect the personnel from these hazards, the accelerator is housed in a shielding enclosure.

The safety systems are designed to prevent access to the enclosure while the RF system is operating and allow only limited access to the area while the laser is operating.

In order to allow for tuning of various components the safety system is designed to operate in three modes:

- A. Laser Only Mode allows the laser shutter to be opened while preventing the accelerator from operating. Personnel have access to the tunnel, under controlled conditions, to make adjustments to the laser system in this mode.
- B. RF Only Mode allows the RF system to operate while preventing the laser shutter from opening to prevent any possible beam acceleration while tuning and/or testing the RF system. Personnel are denied access to the tunnel in this mode.
- C. Beam Mode allows the RF system to operate and opens the laser shutter. Personnel are denied access to the tunnel in this mode.

The mode of operation is selected by a rotary switch located in the control room. An individual must assure that this switch is set to the proper mode before attempting to secure the tunnel.

II. DESIGN PHILOSOPHY

The safety system for the AWA Linac Tunnel is designed to protect personnel by:

- A. Assuring that any occupant of the tunnel is given a warning before the accelerator can begin operation or the laser beam is allowed into the area, depending on the mode of operation selected.
- B. Providing the means for someone in the tunnel to prevent either mode of operation from starting.

- C. Controlling personnel access to the tunnel during "laser only" operation.
- D. Preventing personnel access to the tunnel during "RF only" and "beam" operation.

III. HARDWARE

The safety system for the AWA Linac Tunnel consists of:

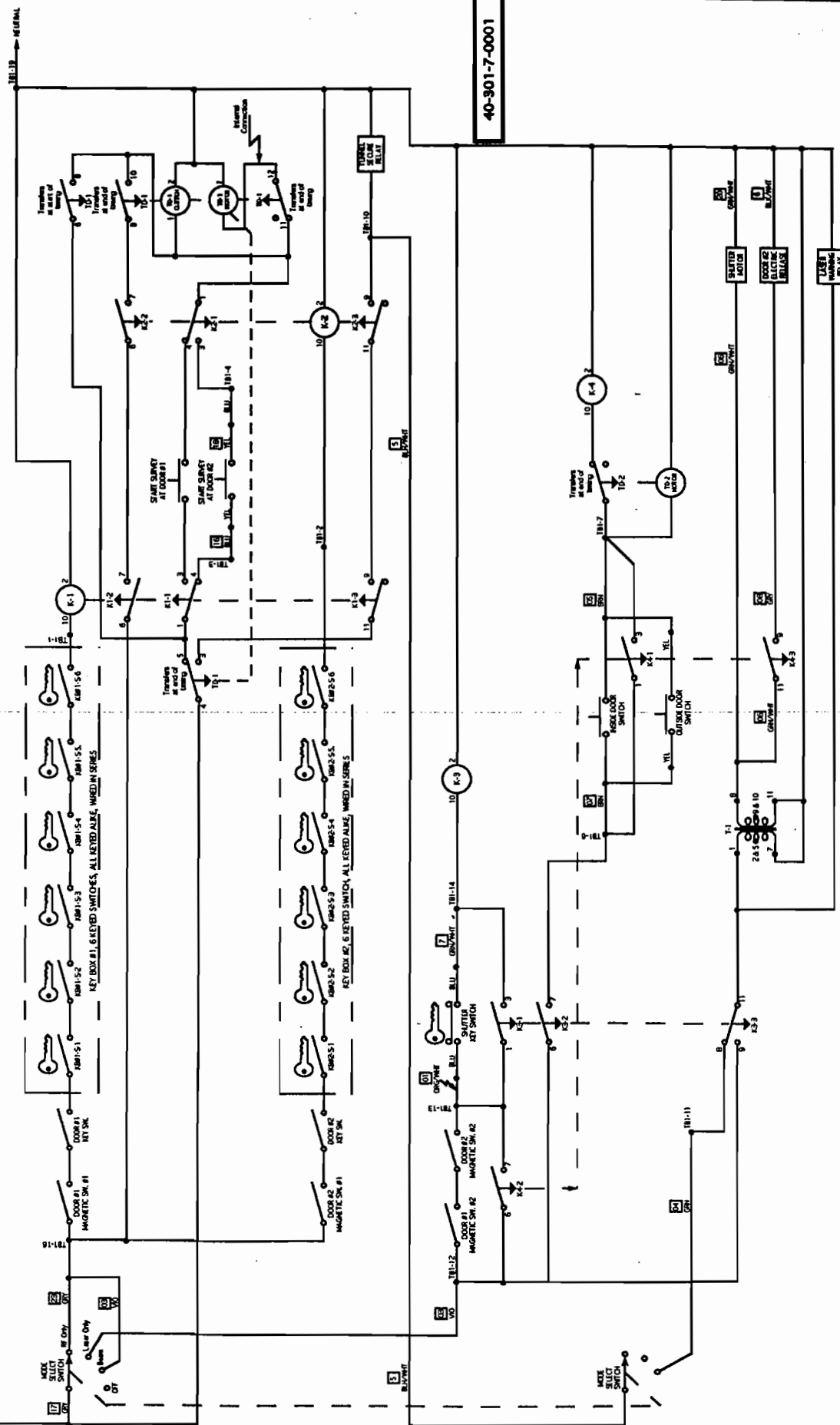
- A. Interlock system - the main purpose of this system is to control access to the tunnel during "laser only" operation and to prevent access to the tunnel during "RF only" and "beam" modes. Access to the tunnel is through either of two doors. The doors use a key operated electro-mechanical lock and switch. The doors must be closed and locked in order to satisfy the switch. The key is captive on a ring with the accelerator RF lockout key and the laser shutter control key, assuring that these systems must be off in order for the key to be available to open the doors. A timed electrical door release is provided, which will allow door #2 to be opened briefly in "laser only" mode, to allow personnel to access the tunnel to make adjustment to the laser system. In addition, magnetic switches are mounted at each door. Opening either door will de-energize one of these switches and provide the same type protection as the key operated switches.
- B. Safety Switches - placing any safety switch in the SAFE position will prevent the RF system from operating and the laser shutter from opening. Boxes containing six safety switches each are located adjacent each of the access doors. All switches must be in the RUN position for any operation to occur.
- C. Survey and Closure System
 - 1. Laser Only Mode - once entrance to the tunnel has been made, except during the timed release mentioned above, a SURVEY must be made in order to secure the tunnel and allow the laser shutter to be opened ALL safety switches must be in the RUN position. Door #1 is closed and the individual making the survey proceeds through the tunnel, checking that no personnel are in the area, to door #2 which he immediately closes. Closing both doors will activate a rotating light and audible alarms (Sonalerts). This warns all personnel that the area is going to become a hazard area.

Once the warning system begins operating, all personnel have 30 seconds to leave the area or pull the EMERGENCY OFF CABLE before the laser shutter is opened. Once the warning sequence is completed, the key operated laser shutter control switch may be activated. Since the laser shutter key, the access door key and the RF lockout key are on the same



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40-301-7-0001

DESIGNED BY G. Cox
REVISED DATE 6/10/93

Revised 6/10/93 - TD-1 quality method
TUNNEL RADIATION AND
LASER SAFETY SYSTEM

40-301-7-0001

AWA LINAC TUNNEL SAFETY SYSTEM
DRAWN G.C. 3/93